



CDW CONSULTANTS, INC.
CIVIL & ENVIRONMENTAL ENGINEERS

**PHASE II
LIMITED SUBSURFACE
INVESTIGATION**

**City of Waltham
225-227 & 240 Beaver Street
Waltham, MA**

Prepared for

City of Waltham
119 School Street
Waltham, MA 02451

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CDW Project # 1830.0



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1.0 INTRODUCTION

CDW Consultants, Inc. (CDW), on behalf of our client, City of Waltham, has conducted a limited subsurface investigation on the Site which is located at 225-227 and 240 Beaver Street, Waltham, Massachusetts (Figure 1). The investigation included the advancement of soil borings, soil sampling and analysis, installation of three monitoring wells and groundwater sampling and analysis. This investigation was conducted to evaluate the presence or likely presence of hazardous substances or petroleum products on the property in areas of concern identified in CDW's Phase I Environmental Site Assessment report (Final report dated July 2019).

1.1 Purpose

The purpose of the investigation was to evaluate subsurface conditions in specific areas that, through historic operations, may have been impacted by identified potential sources of contamination at the Site. This investigation was performed in accordance with Massachusetts General Law (MGL) Chapter 21E.

1.2 Site & Surrounding Area Description

CDW conducted an ASTM Phase I investigation of the properties listed as 240 Beaver Street and 225-227 Beaver Street, in Waltham, Massachusetts (the "Site"; Figure 1). The assessment includes one 27.9-acre parcel located at 240 Beaver Street and one 30.84-acre parcel located at 225-227 Beaver Street. Both properties comprise the University of Massachusetts Agriculture Experiment Station that was gifted to the Commonwealth in the early 1900s for educational purposes.

The southern parcel (referenced as Parcel #1) is located at 240 Beaver Street and is improved with a 7,474 square foot administration building built in 1948. The three-story building has approximately 20 offices and an attached auditorium of approximately 5,000 square feet. It is currently used for office space and is known as the main building of the Waltham Experiment Station. The parcel also contains the Gray Workshop Building with four attached greenhouses, a Boiler Building that formerly generated heat for the buildings, the Corn Laboratory with two attached greenhouses, and hoop-style greenhouses. The Administration Building, Gray Workshop Building and the Boiler Building are the main structures currently in use. The parcel is bordered by the Cornelia Warren Ball Fields to the east, Waverly Oaks Road- Route 60 to the south and a residential neighborhood to the west. Access to Parcel 1 is via three gravel driveways that enter the site from Beaver Street. Two driveways provide access and parking along the east, west, and south side of the administration building and the other provides access along the eastern side of the Gray Workshop Building with parking on the south side of the building.

The Parcel 1 buildings are connected to municipal water, sewer and natural gas. The Administration Building was formerly heated with #2 fuel oil, supplied by two 7,500-gallon underground storage tanks (USTs), which were reportedly removed. The Gray Building was formerly heated with #2 fuel oil, supplied by one 1,000-gallon UST that was removed in 1992.

Parcel 2 (225-227 Beaver Street) consists of an abandoned farmhouse and dairy farm buildings including barns, storage sheds, and foundation structures for former buildings. Most of these structures are in disrepair and several have collapsed. The upland field west of the wetland was used for hay production and grazing. The northern portion of this parcel contains approximately 16 acres of wetlands, meadow and succession forest vegetation. The wet meadow and wetland areas were not developed. The parcel is bounded to the north by the Fernald State School, to the south by Waverly Oaks Road and Beaver Street, to the west by Camp Cedar Hill and associated buildings owned by the Girl Scouts of Eastern Massachusetts, and to the east by Waverly Oaks Road. The wetlands contain an approximately 4,600 square feet area of fly ash material brought from an off-site source used for an agricultural research experiment conducted in the 1970's known as the Phoenix Project (a joint USEPA, Mass DEP and City of Waltham DPW project).

According to a July 2016 Periodic Review Class C1 Response Action Outcome by Ramboll Environ, the UMASS experimental station disposed of approximately 66 to 77 tons of municipal incinerator ash residue on Parcel 2 during the summer of 1977. No buildings were known to have been constructed on or near the ash disposal site. The upland field west of the disposal site was used for hay production and/or grazing of cows. The wet meadow was never developed.

The Site is located on the Boston Southwest United States Geological Survey (USGS) 1987 Quadrangle Map at the following approximate location and elevation:

Southern Parcel 1	
Universal Transverse Mercator (UTM) Zone 19 Coordinates	
317708.01	UTM E (Meters)
4694755.68	UTM N (Meters)
Latitude/Longitude	
42.383709°	Latitude (North)
-71.214428°	Longitude (West)
Elevation	
58	Feet above sea level
Northern Parcel 2	
Universal Transverse Mercator (UTM) Zone 19 Coordinates	
318032.00	UTM E (Meters)
4694878.00	UTM N (Meters)
Latitude/Longitude	
42.384886°	Latitude (North)
-71.210534°	Longitude (West)
Elevation	
58-48	Feet above sea level



2.0 SUMMARY OF PHASE I SITE ASSESSMENT

CDW completed a Phase I Environmental Site Assessment in July 2019. The investigation conducted by CDW personnel included a review of available federal, state, and local environmental agency records to identify the presence or likely presence of Recognized Environmental Conditions (RECs), Historical Recognized Environmental Condition (HRECs) and Controlled Recognized Environmental Condition (CRECs). No CRECs were identified during the assessment. RECs and HRECs were identified during the assessment. They were:

The following HRECs and areas of concern were identified during the assessment:

- An HREC was identified on the southern Parcel 1 located at 240 Beaver Street where a portion of the parcel is listed as a Massachusetts Waste Disposal Site that has been assigned Release Tracking Number 3-28048 for a release of oil. A Class B-1 RAO was submitted to the Massachusetts Department of Environmental Protection (MassDEP) on October 5, 2009 as assessments of the release have demonstrated that No Significant Risk exists as a result of the release and therefore site closure has been achieved.
- An HREC was identified on the southern Parcel 1 located at 240 Beaver Street where a portion of the parcel is listed as a Massachusetts Waste Disposal Site that has been assigned Release Tracking Number 3-28050 for a release condition of heavy metals in soil. A Class A-1 RAO was submitted to MassDEP on October 11, 2009 after soil remediation was completed, demonstrating that No Significant Risk exists as a result of the release and therefore site closure has been achieved.
- Parcel 1 (240 Beaver Street) was the site of an upland fly ash research area, and Parcel 2 (225-227 Beaver Street) was the site of a wetlands fly ash research area.
- According to the maintenance foreman for Parcel 1, arsenic based pesticides and herbicides had been stored on-site, and used in the past inside the greenhouses.
- The area in the vicinity of the former 1,000-gallon gasoline UST was reported to have had a release of 196 gallons of gasoline and was removed in 1992.

3.0 LIMITED SUBSURFACE INVESTIGATION

3.1 Topography and Hydrogeologic Features

The Site is located between 48 and 58 feet above sea level, and the topography is generally hilly. According to the USGS geological map the bedrock at the Site consists of diorite and gabbro (Zdigb) (Zen et. al. 1983). The Salem Gabbro-Diorite is described as a Proterozoic mafic plutonic rock that retains its igneous texture with some feldspars and mafic minerals altered to chlorite and epidote. There were no bedrock outcrops observed at the Site.



There are no known drinking water source areas or private well supplies within 500 feet of the Site. The Site is not located within a Potentially Productive Aquifer and no community or known non-community drinking water supply, or MassDEP-approved or interim wellhead protection areas, exist within one mile of the Site.

Federal Emergency Management Agency Flood Insurance Rate Maps indicate that the wet meadow wetland basin is located in a Zone A2 floodplain, which is defined as an area within the 100-year flood zone where base flood elevations and flood hazard factors have been determined. The periphery of this area is designated as a Zone B floodplain, which is defined as an area between the 100 year and the 500-year flood limits. The remainder of southern parcel is located in Zone C floodplain which is outside of the 500-year flood limit.

3.2 Soil Borings and Monitoring Wells

On May 28 and 29, 2019, CDW advanced nine (9) soil borings GP1-1 to GP1-9) at 240 Beaver St and GP2-1 to GP2-4 at 225 to 227 Beaver Street, respectively. The soil borings were advanced track mounted Geoprobe equipped with 5-foot long 2-inch diameter large bore sampling tubes. Soil samples were collected continuously in 5-foot acetate sleeves inserted into large bore sampler to depths ranging from 20 feet at 240 Beaver Street to 5 feet at 225-227 Beaver Street. All soil samples were classified on-site. CDW's subcontractor, Crawford Drilling of Westminster, MA completed the advancement of the soil borings. Soil boring logs are included in Appendix A. CDW's subcontractor, Contest Laboratories, Inc. of East Longmeadow, Massachusetts, completed the laboratory sample analyses.

The selection of the locations of the borings was based upon the potential source of contamination at the Site.

240 Beaver Street

- GP1-1 was in the area of the two former 7,500-gallon #2 heating oil USTs.
- GP1-2 was in the area of an existing pesticides storage shed.
- GP1-3 was in the area of the former 196-gallon gasoline release from a former 1,000-gallon gasoline UST.
- GP1-4 was located by a storage area containing tractors and other power equipment.
- GP1-5 and 6 were in the vicinity of the former "fly ash" experimental test area.
- GP1-7 and 8 were in the southern dumpsite closest to Waverly Oaks Road.
- GP1-9 was in the area of a former gasoline UST to the north of greenhouse #3.

225-227 Beaver Street

- GP2-1 was located to the north, in front of the residential house to address possible petroleum related concerns related to heating oil AST piping observed penetrating the front of the house in two locations.



- GP2-2 was in the vicinity of the former silos to the north of the house.
- GP3-3 was in the vicinity of the former calf barn.

240 Beaver Street

A two-inch diameter monitoring well was installed to a depth of 20 feet in borings GP1-3, GP1-5, and GP1-7. The wells were constructed of a 10-foot length of two-inch diameter 0.010 slotted polyvinyl chloride (PVC) well screen threaded to solid PVC riser. Uniformly graded sand was placed around the well screen up to one foot above the screen. One foot of bentonite grout was placed above the sand, followed by native fill to grade. A protective roadway box was installed at grade. The boring/groundwater monitoring well locations are depicted on Figure 2.

225-227 Beaver Street

No monitoring wells were installed at the various boring locations. Refusal on possible bedrock above the water table was encountered at all boring locations. Refusal was encountered between 8 and 10 feet in all boring locations.

3.3 Soil Screening and Laboratory Samples

Soil samples were collected continuously from samples from each boring and field-screened with a photoionization detector (PID) using the headspace method. The soil headspace screening results are provided on the boring logs in Appendix A. The PID is an instrument used to quantify total organic volatiles (TOVs) that ionized at or below 10.6 electron volts (a range which includes gasoline and some fuel oil organics). The detection limit for the instrument is 0.1 parts per million (ppm). One soil sample from each of nine (9) borings at 240 Beaver Street and three (3) borings at 225-227 Beaver Street was selected and submitted for laboratory analysis for extractable petroleum hydrocarbons (EPH), volatile organic compounds (VOCs), volatile petroleum hydrocarbons (VPH), and MCP 14 metals. One soil sample from each boring at the depth that exhibited the highest field screening reading or field evidence of contamination was collected. If no field instrumentation readings were registered during drilling, the soil sample was collected from the vadose zone. The samples were preserved by ice, refrigeration and methanol, as appropriate, prior to laboratory analysis, and delivered to the laboratory accompanied by an appropriate chain of custody record.

3.4 Groundwater Sampling

On June 5, 2019, CDW collected groundwater samples from three newly installed monitoring wells (GP1-3, GP1-5, and GP1-7) and one existing monitoring well (MW-2). All wells were allowed to equilibrate for at least one week prior to sampling. The wells were purged and sampled using disposable polyethylene bailers. At least three well volumes were purged from the well prior to collecting the samples. The groundwater collected was free of silt and was clear during the sampling event. The samples were submitted to CDW's subcontractor, Contest Laboratories, for analysis for EPH, VOCs, VPH, and MCP 14 Metals. The samples for metals analyses were filtered in the field



prior to preservation. In addition, groundwater from monitoring wells GP1-5 and GP1-7 were analyzed for herbicides, pesticides, and PCB's.

3.5 Groundwater Gauging

On June 5, 2019, newly installed monitoring wells and existing monitoring wells were gauged for depth to groundwater and the presence of non-aqueous phase liquid (NAPL) using an oil/water interface probe. Measurements were made to the top of the PVC riser. No NAPL was observed in any on-site monitoring wells. Depth to groundwater ranged from 10.82 feet below the ground surface to 12.69 feet bgs. A groundwater elevation survey was performed. Groundwater appears to be potentially flowing in two directions at the site with a possible groundwater divide. Groundwater in the northern portion of 240 Beaver St appears to be flowing in a northeasterly direction toward a wetland area located in the southern portion of 225-227 Beaver Street. Groundwater in the southern portion of the site appears to be flowing in a southwesterly direction towards low wetland areas closest to Waverly Oaks Road.

Groundwater Flow direction was not calculated at 225-227 Beaver Street. No wells were installed due to possible bedrock refusal.

The depth to groundwater measurements are provided in Table 2.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 Soil and Groundwater Classifications

The selection of a soil classification of RCS-1, as defined in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0361(1)(a), for the comparison of Reportable Concentrations, is applicable to the Site because:

- The soil samples are located within 500 feet of a residential property.
- The property is zoned as a recreational area and is open to the public.

The selection of a groundwater classification of RCGW-2, as defined in the MCP, 310 CMR 40.0362, for the purpose of identifying Reportable Concentrations, was based upon the following criterion:

- RCGW-2 shall be applied to all groundwater that is not within a current or potential drinking water source area.



4.2 Soil Sample Analysis Results

240 Beaver Street

Laboratory analysis of soil samples did not reveal detectable concentrations of VPH compounds, VOC's, Herbicides, or PCB's.

Laboratory analysis of soil samples revealed detectable concentrations EPH compounds, total metals, and pesticides. EPH compounds detected in GP1-7 (10-12') and GP1-8 (10-12') are reported below MCP RCS-1 Reportable Concentrations. The presence of 4,4'-DDT was detected in GP1-7 (3-5') at a concentration of 12 milligrams per kilogram (mg/Kg, or parts per million, ppm) which is above the RCS-1 Standard of 6 mg/Kg. Several heavy metals were detected in GP1-7 (10-12') and GP1-8 (10-12'). Concentrations of Total Chromium (730 mg/kg) and Lead (220 mg/Kg) in GP1-7 (10-12') were detected above RCS-1 Reportable Concentrations of 100 mg/Kg and 200 mg/Kg, respectively. The results of all soil analyses are summarized in Table 1. A copy of the laboratory analytical report is included in Appendix B.

225-227 Beaver Street

Laboratory analysis of soil samples did not reveal detectable concentrations of VPH compounds, VOC's, EPH compounds, Herbicides, or PCB's. Low levels of various heavy metals were detected in the three soil samples submitted for analysis. No concentrations were detected above MCP RCS-1 Reportable Concentrations.

4.3 Groundwater Sample Analysis Results

240 Beaver Street

Groundwater samples were analyzed for EPH, VPH, VOCs, PCB's, and MCP14 metals. No PCB's were detected in groundwater above laboratory detection limits.

No EPH and VPH concentrations were detected in newly installed monitoring wells GP1-3MW, GP1-5MW, and GP1-7MW. Low levels of C9 to C18 Aliphatics and Ethylbenzene were detected in a previously installed one-inch micro well in the vicinity of the former 7,500-gallon fuel oil UST's. No concentrations exceeded MCP RCGW-2 Standards.

Low levels of dissolved metals were detected in all four monitoring wells.

Low levels of pesticides were detected in monitoring well GP1-7MW located in the southern portion of the site. No concentrations exceeded MCP RCGW-2 Standards.



Low concentrations of VOC's were detected in monitoring wells GP1-7MW and MW-2. No concentrations exceeded MCP RCGW-2 Standards.

The results of groundwater analyses are included in Table 2. The laboratory analytical report is included in Appendix C.

225-227 Beaver Street

No groundwater samples were collected from the site.

5.0 SUMMARY

The Site study area for this Phase II Investigation consists of a portion of the property at 225-227 Beaver Street and 240 Beaver Street. This investigation focused on subsurface testing in areas of the property that are potential areas of environmental impact. Based upon the results of subsurface soil and groundwater testing and site observations, CDW is presenting a summary of the key observations.

On May 28 and 29, 2019, CDW advanced nine (9) soil borings (GP1-1 to GP1-9) at 240 Beaver St and GP2-1 to GP2-4 at 225 to 227 Beaver Street, respectively. A two-inch diameter monitoring well was installed to a depth of 20 feet in borings GP1-3MW, GP1-5MW, and GP1-7MW at 240 Beaver Street. No wells were installed at 225-227 Beaver Street due to possible bedrock refusal in all three borings and subsequent adjacent boring locations.

Soil samples were collected continuously from samples from each boring and field-screened with a PID for TOVs. One soil sample from each of nine (9) borings was selected and submitted for laboratory analysis for EPH, VPH, VOCs, PCB's, Herbicides, Pesticides, and MCP 14 Metals. Laboratory analysis of soil samples revealed detectable concentrations EPH compounds, total metals, and pesticides. EPH compounds detected in GP1-7 (10-12') and GP1-8 (10-12') are reported below MCP RCS-1 Reportable Concentrations. Low levels of 4-4' DDT were detected in GP1-7 (3-5') at a concentration of 12 mg/Kg. Total Metals compounds were detected in GP1-7 (10-12') and GP1-8 (10-12'). Total chromium was detected at a concentration of 730 mg/kg, which is above the applicable RCS-1 threshold of 100 mg/kg. Lead was detected at a concentration of 220 mg/Kg which is above the applicable RCS-1 threshold of 200 mg/Kg.

On June 5, 2019, CDW collected groundwater samples from the newly installed monitoring wells (GP1-3MW, GP1-5MW, and GP1-7MW) and one existing monitoring well MW-2. Groundwater samples were analyzed for EPH, VPH, VOCs, PCB's, and MCP14 metals. Low levels of C9 to C18 Aliphatics and Ethylbenzene were detected in a previously installed one-inch micro well in the vicinity of the former 7,500-gallon fuel oil UST's. Low levels of dissolved metals were detected in all four monitoring wells.



Low levels of pesticides were detected in monitoring well GP1-7MW located in the southern portion of the site. No concentrations exceeded MCP RCGW-2 Standards. Low concentrations of VOC's were detected in monitoring wells GP1-7MW and MW-2. No concentrations exceeded MCP RCGW-2 concentrations.

6.0 RECOMMENDATIONS

Based upon the Phase II Investigation, CDW has the following recommendations:

As stated above, several possible conditions exist that will require the current or potential future owner to report the release conditions to the MassDEP within 120-days of knowledge. It is possible that additional testing for the presence of Chromium (IV), coal, coal ash, and wood ash, and further inquiry about the historical use of pesticides will demonstrate that one or several of the reporting conditions are exempt as provided in the MCP.

Therefore, it is recommended that an additional soil sample be collected from adjacent to boring GP1-7 from the same depth and test for Hexavalent Chromium (Chromium VI), ORP, and pH and compare to existing RCS-1 standards. The testing would need to be completed within the 120-day period prior to notification. If the Chromium (VI) sample is lower than the applicable RCS-1 standard of 30 mg/kg, then notification to MassDEP for the presence of chromium will not be required.

In addition, the presence of lead at 220 mg/kg is reportable. The same soil sample should also be tested for the presence of coal, coal ash and wood ash. The presence of lead as a result of the coal, coal ash or wood ash would exempt the lead from the 120-day notification requirement as well. Lastly, the presence of 4-4' DDT may not be a reportable event if it can be demonstrated that it's presence is exclusively a function of its proper use in accordance with manufacturers labeling and specification.

If the presence of these contaminants persist, the MCP allows for situations where limited soil removal can be conducted (up to 20 cubic yards) as a "Limited Removal Action." If the work is completed and the soil is retested within 120-days and the results are less than the RCS-1 standard, then reporting will not be required.

Due to prior releases and uses of chemicals on-site, future soil excavation on-site should be conducted under a soil management plan. If soils will be exported, the quality of the exported Site soils must be acceptable to the destination site pursuant to MassDEP regulations and policies. At a minimum, the industry-wide practice of collecting one composite sample for every 500 cubic yards of soil to be disturbed should be tested for disposal or reuse analytical parameters. Additional sampling and testing may be required, based on the outcome of prior testing or other destination-specific requirements.



The sampling and analytical program was specific to one or more areas of the Site where testing was accessible, and potential contamination could have or has occurred. Historical research does not guarantee that all former Site use, storage and disposal practices have been properly recorded and/or are presently known. No opinion can be rendered on the presence or absence of contaminants in areas between the sampling locations identified herein. If during future site work or sampling, evidence of a release to soil and/or groundwater is encountered, measures must be conducted to properly manage those conditions.

7.0 LIMITATIONS

This investigation was intended to provide a general assessment of current subsurface conditions and was limited in nature and scope. The findings are limited to the information available at the time of the investigation and the scope of services as defined. The results of the limited subsurface exploration performed on this Site provide the basis for the findings and are representative of conditions at the time of the investigation. No other conclusions, interpretations, or recommendations are contained or implied in this report other than those expressed. Also, CDW makes no warranty, expressed or implied, on the accuracy of the work and information completed by others and upon which CDW has relied to prepare this report. No other use of this report is warranted without the written consent of CDW Consultants, Inc.